

Wind-diesel systems on two Estonian islands: Osmussaar & Vaindloo

**Presented by
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Location of the sites



General information

- The task was to provide electric power supply of remote radar stations, far from the national grid
- Previous generation was by diesel only
- Wind-diesel requested by the buyer because of high cost of diesel generation
- System type and supplier selected on a commercial basis – no subsidies involved

Organizations involved

- **Estonian Border Guard**
Buyer and user of the radar stations
- **Empower EEE AS**
Estonian company responsible for construction of the radar stations, including power supply
- **PitchWind Systems AB**
Swedish Wind Hybrid Power System supplier selected by Empower
- **ÅF-System AB**
Consulting company based in Sweden, hired by PitchWind
- **Other sub-suppliers**



Background: The “unknown” technical development in Sweden

- Advanced development of wind turbines, e.g. technically successful light-weight designs by Nordic Windpower
- Diesel genset competence and equipment, e.g. Scania genset engines capable of low load operation
- Special wind-diesel competence pioneered by Chalmers University of Technology. This provided a base e.g. for PitchWind.



Osmussaar

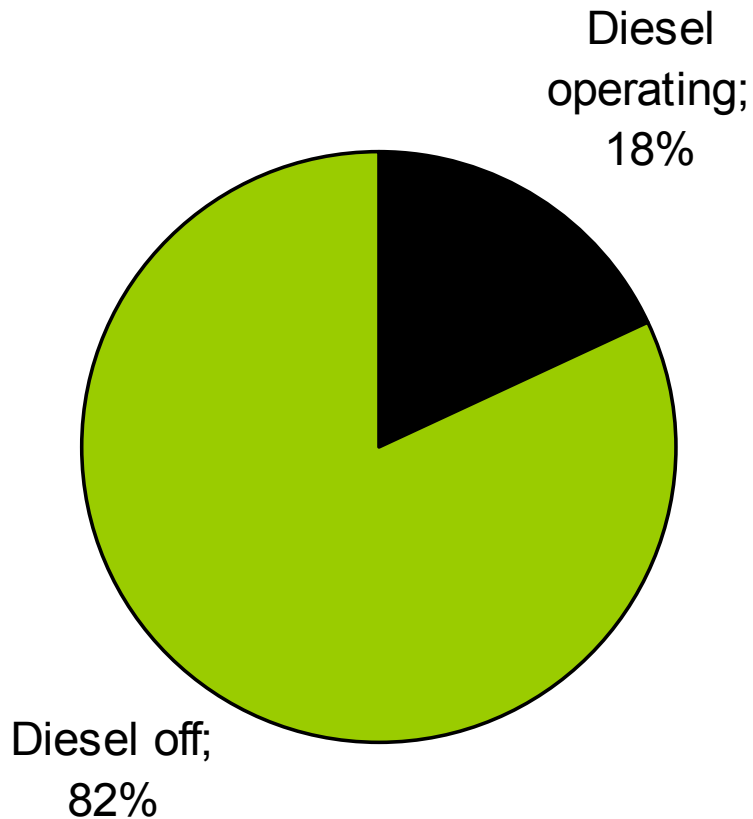
- Wind-diesel system rated 30 kVA
- Total investment in power system about 200 000 EUR
- Commissioned in Dec. 2002
- Average wind speed 7.8 m/s at 30 m height
- Typical load 5-10 kW



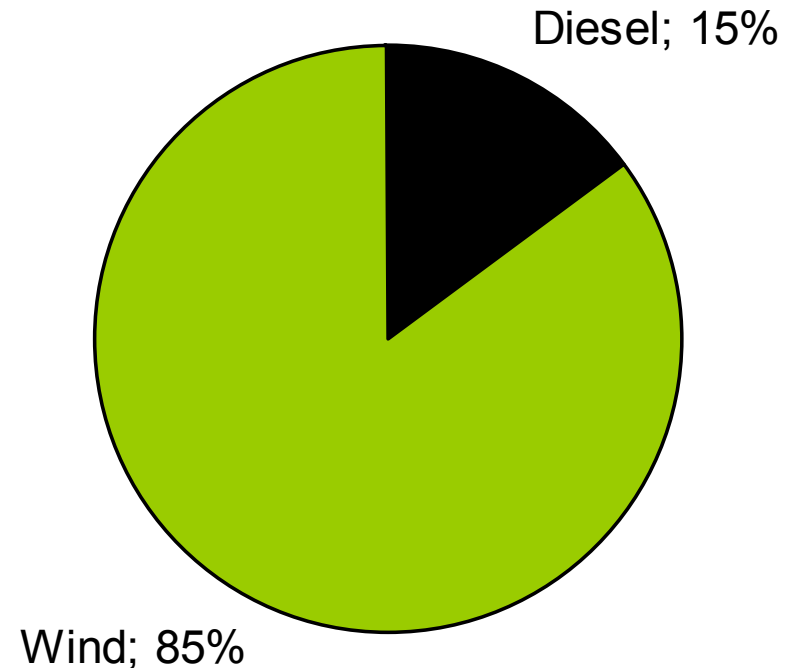
Osmussaar results

19 months of operation (December 2002 – July 2004)

TIME



ELECTRICITY PRODUCTION





Two-bladed rotor transported in one piece



This and the following pictures show the installation of the wind turbine on Osmussaar







Wind turbine
PW 30/14
(30 kW,
 \varnothing 14 m),
delivered with
PitchWind's
Hybrid
Control
System
(HCS)



Two ordinary
SDMO diesel
gensets,
each rated
32 kW

(the reason
for two
gensets is
redundancy)

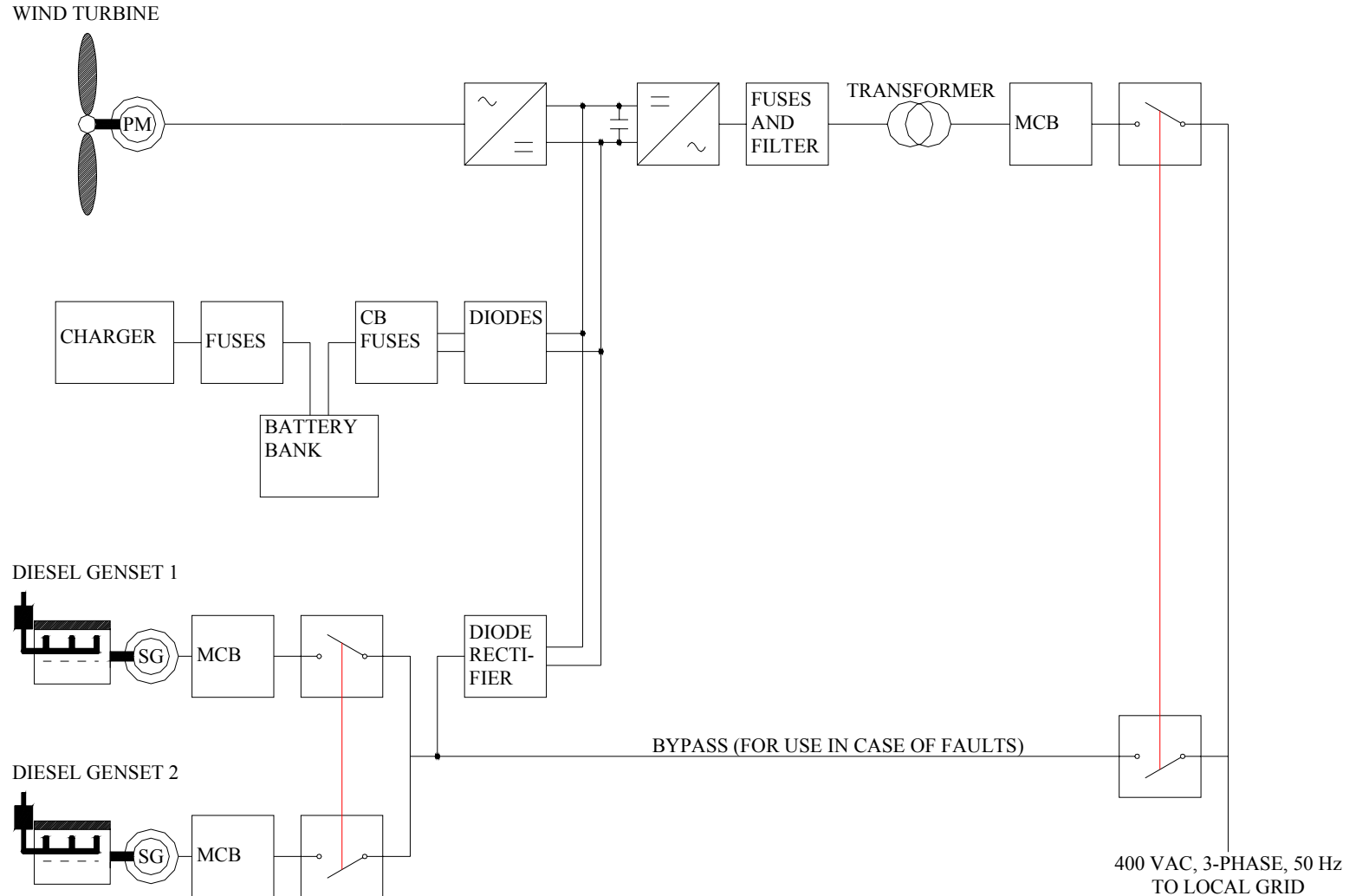


Battery bank
408 V nominal
250 Ah gross capacity



System is
built for
unmanned
operation

Simplified circuit diagram



PitchWind's hybrid concept



- Scalable for power needs in the range 10-200 kW
- Based on standard components
- Demand side management is an extra option (simplified by the open LonWorks control system)
- Other power sources can also be integrated

Vaindloo

Wind-diesel system almost identical to Osmussaar





This photo of Vaindloo was taken before the wind turbine installation

Climbing crane on Vaindloo



- Simplifies installation on remote sites
- No ordinary mobile crane needed
- Can be used also for very tall towers, where tilt-up towers are not convenient

Important lessons learned

- Thyristor controlled loads need special attention! They can cause the inverter to trip, unless special measures are taken to prevent this.
- Small isolated grids with three-phase supply sometimes have very unbalanced loads. It is an important characteristic of the frequency converter to be able to cope with these conditions and balance the load on the generators.
- Operators have sometimes made mistakes, e.g. by leaving the system with all diesel gensets turned off. The remote supervision by GSM has been very helpful to detect such problems in time, so this could be corrected before the batteries were empty!

- Be aware of the mean dog on Vaindloo!

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